REMARKS – General

By the above amendment, applicants are amending the Specification and Claims to define the invention patentably over the prior art. Changes to three of the figures are proposed.

Drawings

Changes are proposed for amendments to FIGS. 1A, 1B, and 3. The purpose of these changes is to add clarity for what was originally disclosed within the text of the specification and claims and correspondingly to show within the drawings all of the elements appearing within the claims.

What is marked up in red for adding to FIGS. 1A and 1B are additional side-polished fiber-optic apparatuses, both 4-port and 2-port, to better illustrate what was discussed in the original specification. These additional apparatuses are given unique new callout numbers, and amendments to the appropriate specification paragraphs are included below to reference them.

What is marked up in red for adding to FIG. 3 are grooves perpendicular those originally shown. This will serve to illustrate what was discussed in the original specification. These additional grooves are given unique new callout numbers, and amendments to the appropriate specification paragraphs are included below to reference them.

The remarks below addressing the amendments to specification paragraphs and claims are intended to further support these drawing changes.

Claim Rejections Under 35 USC § 102(b), and Responses To Same

A first group of claims (1, 3-6, 16, and 17) was rejected under 35 USC § 102(b) as being anticipated by Tseng et al. (US 5,809,188). Of these claims, claims 3-6 are dependent claims dependent upon independent claim 1; claim 16 is an independent claim, and claim 17 is a dependent claim dependent upon claim 16.

The § 102(b) rejection of this first group of claims is based on the following observations:

a) "Tseng et al. in figures 1-4, discloses a fiber optic apparatus comprising crystal substrate 40 having first surface (top), a first array of groove 120 (figure 4a) etched into the surface, an array of fibers 10 held in the grooves, wherein the fibers are held in the substrate forms a multiple apparatuses."

b) "For claims 3 and 4, the substrate is disclosed to be silicon (column 2, lines 40-45), and can be etched on Miller plane and for claims 5 and 6, the disclosed device is a filter."

c) "For claim 16, the two sides of the substrate form two ports."

d) "For claim 17, thin film over side polished area is also disclosed in figure 2a."

With this amendment B, applicants have deleted claims 1-20 and submitted a set of substitute claims 37-56 to define patently over Tseng et. al. Applicants have maintained the same number of claims (20) and the same number of independent claims (6) as before. If the new independent claims 37, 45, 51, 53, 54, and 56 are novel, then their dependent claims also are consequentially novel. Each of the new independent claims claim novel and unobvious material not discussed or taught by Tseng et al. or by any other prior art to applicants' knowledge.

Independent claim 37 claims an alignment fiber within a channel formed by two arcuate grooves in two oppositely facing substrate surfaces. The substrate surfaces also contain an array of 4-port side-polished fiber-optic apparatuses, all of which can be properly aligned with the aid of the alignment fiber within its arcuate channel. This is new and novel.

Independent claim 45 is a similar claim to claim 37, only using different language.

Independent claim 51 claims two side-polished fibers bonded together by a film at their region of side-polish, the pair of fibers then supported with the only rigid support being very near only to one of the fibers near to the regions of side-polish. This too is new and novel. No such constructions have been disclosed or suggested in the prior art. Generally speaking, in the field of side-polished fiber optics, applicants believe themselves to be the first to perceive the advantages of "free-standing" side-polished fiber-optic apparatuses, where the fiber apparatuses made within

grooves of supporting substrates actually are safely removed from those substrates and supported in ways more suitable to avoidance of thermal stresses from those supporting apparatus.

Whereas claim 51 claims a 4-port apparatus, claim 53 claims a similar 2-port side-polished fiber-optic apparatus that is, for the reasons just described, equally novel.

Claim 54 is a method-of-use claim on the apparatus of claim 37 and is novel and unobvious since the apparatus of claim 37 is novel and unobvious.

Claim 56 claims a structure wherein a side-polished optical fiber is held within a channel that provides a means for delivering a fluid material to the region of side-polish. This has not been disclosed by prior art and is believed to be novel and unobvious. This structure provides a means to alter the optical behaviour of a side-polished communication fiber, wherein using a tapered channel provides lower resistance to the flow of such fluids. Flow resistance is less over and around the fiber up to the regions of side-polish where the only path for fluid then becomes over the top of the fiber.

Request for Withdrawal of Rejections Under 35 USC § 102(b)

In summary, regarding the § 102(b) rejections of the first group of claims (1, 3-6, 16, and 17) as being anticipated by Tseng et al. (US 5,809,188), applicants submit that the substitute claims 37-56 presented with this Amendment B, the independent claims of which are argued above, now satisfy all of the rejections by overcoming the reference to Tseng et al.. Applicants therefore respectfully request the removal of rejections under 35 USC § 102(b).

Rejections Under 35 USC § 103(a)

A second group of claims (2, 7-15 and 18-20) was rejected under 35 U.S.C. § 103(a) as being unpatentable over Tseng et al. (US 5,809,188) in view of Farries (US 5,778,119).

(APPLICANTS' NOTE: Applicants respectfully point out what we believe was an unintended typing error by the examiner in this second office action, wherein "Shaw" was

typed in five places where "Tseng" was intended. Tseng is indeed the first named inventor of the associated patent reference to US 5,809,188. In all these instances of "Shaw", applicants have assumed that "Tseng" was intended. This will be reflected in the remarks that follow.)

The § 103(a) rejection of this second group of claims is based on the following observations (where applicants have replaced "Shaw" with "Tseng" in the mistyped instances of "Shaw" noted above.):

a) "As discussed above, Tseng et al. satisfies the limitations of claims 1, 3-6, 16 and 17. However, Tseng et al. does not disclose a loop system. Farries, in figure 4, discloses looping of fiber for coupling at more than one location."

b) "It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the substrate of Tseng et al. and provide a loop of the fiber so as to couple a particular frequency to a different fiber."

c) "For claim 2, the substrate of Tseng et al. is made of silica and can be etched along Miller planes."

d) "For claim 7, it is obvious to provide second substrate with groove to accommodate the second fiber at coupling location."

e) "For claim 10, the fiber 120 of Farries is polished at two locations."

f) "For claims 11-14, two sides of substrate are opposite sides and forms multi-port apparatus."

g) "For claim 15, the modified device would have stacked substrates with matching grooves and multi-dimension array of fibers."

h) "For claims 18-20, binding of fibers at the interface is well known in the art."

Responses to Rejections Under 35 USC § 103(a)

In response to these rejections, applicants assert that the substitute claims 37-56 are patentable over both Tseng et al. (US 5,809,188) and Farries (US 5,778,119) taken either individually or combined.

In Amendment A, applicants presented arguments in defense of novelty and unobviousness over Ferries. Within independent claims 41 (dependent upon independent claim 37) and 49 (dependent upon independent claim 45), applicants claim construction of multiple side-polished fiber-optic apparatuses having single fiber routed to multiple apparatuses without the need for breaking the fiber and reconnecting or splicing it. None of the literature or other prior art discloses this ability because no one has perceived a means to achieve it.

Summary of Unobviousness Over Tseng et al. In View Of Ferries

Applicants argue that their claims are novel and unobvious, but to overcome the examiner's rejection, applicants have made "looping" only part of two dependent claims (41 and 49), depending upon independent claims 37 and 45 that are novel unobvious over the prior art.

Request for Withdrawal of Rejections Under 35 USC § 103(a)

For all of the above reasons, and with the substitution of new claims, applicant submit that the current application, in the crowded and very active field of fiber optics, especially with the given amendments, is unobvious over Tseng et al. in view of Ferries, as well as over all other prior art, and therefore requests withdrawal of this objection.

Conclusion

For all of the above reasons, applicants submit that the specification as amended in Amendments "A" and "B" and with new substitute claims 37-56 are now in proper form, and that the claims all define patentably over the prior art. Therefore they submit that this application is now in condition for allowance, which action they respectfully solicit.

Conditional Request For Constructive Assistance

Applicants are amending the specification and claims of this application so that they are proper, definite, and define novel structure that is also unobvious. If for any reason this application is not believed to be in full condition for allowance, applicants respectfully request the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and § 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very Respectfully,

Barclay J. Tullis

John H. Prince

---- Applicants Pro Se ----
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Certificate of Mailing: I certify that on the date below this document and referenced attachments will be deposited with the U.S. Postal Service as first class mail in an envelope addressed to: "BOX NON-FEE AMENDMENT, ASSISTANT COMMISSIONER FOR PATENTS, WASHINGTON, DC 20231."

2003 February 7 _____

Barclay J. Tullis, Applicant

Attachments:

-- Appendix 1 to Amendment B, With Replacement Paragraphs Marked-Up to Indicate Changes

-- Appendix 2 to Amendment B, With Changes to FIGS. 1A, 1B, and 3 Marked-Up in Red And Also Showing a Clean Amended Copy for Clarity and Completeness

Appendix 1 to Amendment B

With Replacement Paragraphs Marked-Up to Indicate Changes

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Pursuant to Rule 121, the following is a copy of all of the **paragraphs amended** by the attached Amendment B, with all changes indicated by bracketing deletions and underlining additions:

[0001] A co-pending application entitled "Structures and Methods for Aligning Fibers", having application number 09/825,821, filed on 4 April 2001[, is hereby incorporated herein] by Tullis, now U.S. Pat. No. 6,188,058 is entirely incorporated herein by reference.

[0008] None of the above art, with the exception of a co-pending application entitled "Structures and Methods for Aligning Fibers", by Tullis, now issued as US Pat. No. 6,516,131, teaches methods or apparatuses for facilitating the placement of an array of fibers into an array of grooves of width comparable to the diameter of the fiber.

[0012] The objects of the invention are primarily twofold. One object is to provide new methods for low-cost manufacture of side-polished fiber optics, for use both singly and in compact arrays. These new methods involve process steps, many of which operate on many apparatus units simultaneously, with little additional manual labor over what is required to produce one unit at a time. The other primary object is to create high level assemblies of these fiber[ ]-optic apparatuses in compact arrays that not only save space but also allow for easy interconnection. Examples of apparatuses that can be made with the disclosed integrated side-polished fiber[ ]-optic technology include optical pass-throughs, attenuators, polarizers, couplers, multiplexers, taps, splitters, joiners, filters, modulators and switches. By interconnecting elements within compact integrated arrays of

which include a many-to-one multiplexer, a one-to-many demultiplexer and cross-point switch arrays. The reader will readily appreciate the novel methods and structures used to realize manufacturable fiber[ ]-optic apparatuses and circuits for performing needed all-fiber photonic functions.

[0014] By using fiber-core gratings and/or surface gratings in regions of the side-polished areas and coiling a fiber unbroken around to loop through one adjacent V-groove per cycle along a strip, compact multi-channel optical add-drop multiplexers (OADMs) are easily constructed.

[0016] FIG. 1 shows how varying the widths of face-to-face grooves, and alignment with a sliding, even slightly rotatable, fiber key, can facilitate the tuning of coupling [efficiency]efficiencies in [a]an array of 4-port fiber[ ]-optic apparatuses made with side-polished fibers. The array is shown also having multiple 2-port fiber optic apparatuses.

[0023] FIG. 8 shows a method and means by which to form a multi-channel optical add-drop multiplexer from both a first strip of half-couplers and a second strip of half-couplers, wherein the second strip has a common, unbroken fiber wrapped in recirculating loops through the strip. Either one or both fibers at each coupling region between two side-polished areas would have a core-based or surface-based, wavelength-selective grating.

[0025] Reference is now made to FIG. 1, which consists of two parts, FIG. 1A and FIG. 1B. FIG. 1 shows multiple 4-port and 2-port fiber-optic apparatuses arranged in an array, wherein multiple 4-port fiber[ ]-optic apparatuses can be tuned by translation and/or rotation constrained by an alignment-keying fiber. Thus the art presented and claimed in the copending U.S. patent application titled "Structures and Methods for Aligning Fibers", by Tullis, now issued as US Pat. No. 6,516,131, for aligning a single 4-port apparatus is expanded for aligning arrays of 4-port apparatuses. FIG. 1 shows how varying the widths of face-to-face grooves to create tapered channels, as well as alignment [with a]by sliding with a fiber key (called an alignment fiber) in one of these channels, can facilitate the tuning of coupling efficiency [between two fibers]within [a]multiple 4-port apparatuses.

[This]Each 4-port apparatus can be any of the group including couplers, add-drop multiplexers, taps, splitters, joiners, filters, modulators and switches. [This]The tuning is accomplished by adjusting the interaction length between two evanescently coupled fibers. [Although only a single 4-port apparatus is shown, one can easily envision multiple 4-port apparatuses constructed side-by-side within the same two substrates.]And additional alignment grooves and their [keying]alignment fibers may also be included.

[0026] FIG. 1A shows a tunable array of 4-port fiber[ ]-optic apparatus 1 interspersed with 2-port fiber-optic apparatuses. The 4-port fiber-optic apparatuses may not be all alike; for example one may be[, such as] a coupler[or], while another may be an add-drop multiplexer. The 2-port fiber-optic apparatuses 5A and 5C may not be all alike; for example one may be a polarizer, while another may be an attenuator. [This]The array of 4-port apparatuses 1 is comprised of two arrays of half-couplers 2 and 3. Each of these two arrays of half-couplers 2 and 3 is comprised[in turn] of [respective]side-polished fibers [4 and 5]installed within respective varying-width V-grooves[6 and 7], for example etched into 100 crystal surfaces. A first array of half-couplers 2 is shown comprised of a substrate 10 having a surface 8 containing varying-width grooves 6, 6A, and 6B. A second array of half-couplers 3 is shown comprising a substrate 11 having a surface 9 containing varying-width grooves 7, 7A, 7B, and 7C. The two substrates 10 and 11 are placed with their respective surfaces 8 and 9 [respectively (shown]face-to-face[) of respective substrates 10 and 11] with the grooves of one aligned at least approximately with grooves of the other. The two substrates can be slid over one another in the direction parallel to the long axes (axes not shown) of the [two]side-polished areas 12[and], 13, 12B, and 13B. The two side-polished areas 12 and 13 are shown at a position where they overlap one another, as are the two side-polished areas 12B and 13B. The side-polished areas 12[and 13 of the fibers 4 and 5], 12B, 13, 13A, 13B, and 13C each have an elliptical shape with long axes parallel to the groove axes (not shown). The arrows 14 and 15 indicate the direction of motion desired. The side-polished areas of the fibers 5A and 5C don't have matching areas of another fiber to overlap, however notice that the side-polished area of fiber 5A has a region of space above it created by the groove 6A that lies above it, whereas the side-polished area of fiber 5C doesn't have a groove above it and thus faces the surface

8 of substrate 10. The space above the fiber 5A and its side-polished area 13A, that is the space within the groove 13A would be filled with a gas, a liquid, a fluid containing one or more bubbles, or a solid filler material. The apparatus 1 is additionally comprised of a third fiber 16 which serves as an alignment fiber. Fiber 16 is in a bi-directionally tapered channel 17 constructed of two additional varying-width V-grooves 18 and 19 etched into the surfaces 8 and 9, parallel to grooves 6[and], 7, 6B, and 7B but offset from them. Fiber 16 serves as an alignment key within this channel 17, but allows for the motion described with which to tune the coupling ratio and efficiency of the 4-port assembly. By eliminating any linear portion to the channel 17, the two half-couplers 2 and 3 may be allowed some rotation which is easy to control with the substrates being of a significant scale larger than the side-polished areas, but remain well aligned in the direction of offset just described. One skilled in the art will immediately appreciate that a sliding action along an alignment fiber, or along possibly multiple and parallel alignment fibers, can tune an array of 4-port side-polished fiber-optic apparatuses. And one skilled in the art will also immediately appreciate that a relative rotation of the two substrates, constrained by one or more alignment fibers in their respective and parallel bi-directionally tapered channels, will affect the tune of a 4-port fiber-optic apparatus more, the more distant it is from a center of rotation. This is useful, for example, to optically compensate for a gradient in sidewall thickness often existing across an array of optical fibers. Yet another advantage of the bi-directionally tapered channels 17 and [that]those formed by grooves 6 and 7, 6A and 7A, 6B and 7B, and by 7C alone is that the fibers 16 alone, 4 and 5, 5A alone, 4B and 5B, and 5C alone will experience less chance to be bent and strained entering or leaving their respective channel[17]s than were [it]the channels of constant cross-section. The taper at the ends of these channels can be accentuated to help achieve additional avoidance of strain on the fibers 16, 4 and 5 from otherwise being bent about a sharp edge. It is important in high-bandwidth fiber[ ]-optic applications, such as in modern data- and telecommunications networks, to avoid straining fibers. This is because strain induces birefringence in the fiber and this causes polarization mode-dispersion that can result in high bit-error-rates.

[0027] FIG. 1B shows an end-view of the apparatus illustrated in FIG. 1A with all similar parts identified by the same numbers, except the view is as though the fibers [16,]4,[and] 4B, 5, 5A, 5B, 5C, and 16 were terminated at the midpoints of the channels. In addition, the cores , such as 20 and 21 to fibers 4 and 5 respectively, are depicted as shaded disks or spots. Note how in this view, [one can see]the interface between the two side-polished areas 12 and 13 (and between the two side-polished areas 12B and 13B) [as the region of contact between them]is a region of mutual contact. And [one can perceive]note for example, how the side-polish on the fibers 4 and 5 has allowed the cores 20 and 21 [of the two fibers 4 and 5]to lie closer to one another to cause better evanescent coupling of light waves between the two cores 20 and 21.

[0031] FIG. 2B then shows that the fiber 30 is placed within the groove 32 in the substrate 31, wherein the depth of the groove at its shallowest point positions the fiber 30 such that a portion of the side-wall 34 remains above the surface 33. To accomplish this placement of the fiber 30 within the groove 32, intermediate steps (not shown) may use methods and apparatuses as are disclosed in the copending patent application titled "Structures and Methods for Aligning Fibers", by Tullis, now issued as US Pat. No. 6,516,131. In the current invention, however, dissolvable or meltable bonding materials (used as tacking materials) or other suitable bonding materials 35 and 36 are placed under and over the fiber 30 as depicted with shading in regions 37, 38, and 39. These tacking materials 35 and 36 are used to hold the fiber 30 in place for the subsequent polishing step whose results are illustrated in FIG. 2C. The materials 35 and 36 may be different from one another, or they may be the same.

[0033] Thus the steps of figures FIG. 2A through 2C accomplish the making of what we will call here a first half-coupler 40, or substrate-supported half-coupler, as shown in FIG. 2C. One aspect of the current invention, over the previously disclosed art found within the above cited U.S. patents by Tseng, is that the bonding material 35 and 36 used here need not be wicked into place from the ends of the groove 32. Also, for subsequent method steps to be described below, the material 35 and 36 can be chosen to be dissolvable, meltable, or otherwise remov[e]able, with a minimum of disturbance to the side-polished

fiber 42 within the associated groove 32. If at this point (shown in FIG. 2C) the bonding material was to be removed (not shown), it would allow removal (not shown) of the side-polished fiber 42 from the substrate 31 to create what we will call here a free-standing half-coupler (not shown). A free-standing half-coupler is one that is free of any attached substrate 31 being very near to the region of side-polish or simultaneously to both sides of this region. Generally throughout this disclosure, "free-standing" will mean that any rigid supporting element is not in direct contact with more than one of the group consisting of a) a first side, b) a second side, or c) a region. Within this definition, the terms "first side", "second side", and "region" refer to respective segments of fiber length along the longitudinal axe(s) of side-polished optical fibers in and about a region of side-polish.

[0045] In FIG. 3, a substrate 70 is shown in a plan view 71, a side-view 72, and an end-view 73. A first group of grooves is shown including t[T]wo arcuate grooves 74 and 75[are shown,] and three [straight]constant-width grooves 76,77, and 78[are shown], in an alternating sequence within surface 81[. A], wherein all the grooves 75 through 78 are parallel to one another. A second group of additional grooves 84, 85, and 86 is shown perpendicular to the first group. Preferably, the widths and depths of the straight grooves 76, 77, and 78 are equal to or larger than the widths of the arcuate grooves 74 and 75 where the arcuate grooves 74 and 75 reach the ends 79 and 80 of the substrate 70. The surface area left un-etched 81 between these grooves should be minimized in order to facilitate the parting of substrates (31 and 58 in FIG. 2I) placed with these faces (31 and 52 in FIG. 2I; 81 on the substrate illustrated in FIG. 3) touching one another. The substrate 70 illustrated would be able to accept two optical side-polished fibers, one in each arcuate groove. A linear array of more numerous arcuate grooves can be etched into a common substrate, with one or more extra parallel grooves (illustrated as [straight]constant-width and constant-depth grooves in FIG. 3) interleaved between them, but only two arcuate grooves and three extra parallel grooves are illustrated in FIG. 3 for drawing simplicity. As was discussed above, the purpose of the extra parallel grooves is at least two-fold. One such purpose is to act as a barrier against spreading of permanent bonding material when fabricating a freestanding coupler. Another such purpose is to provide air access channels when parting two such surfaces that have been put face-to-face against one another. Also as discussed above, the

purpose of the second group of additional and perpendicular grooves 84, 95, and 86 is to provide channels for access of air (or other fluid), for UV light to cure UV adhesive, and for parting tools, but they too can be used to limit flow of adhesive and reduce the area of bonding between two face-to-face substrates.

[0054] FIG. 5 shows a means 110, adapted from the copending patent application entitled "Structures and Methods for Aligning Fibers", by Tullis, now issued as US Pat. No. 6,516,131, by which to align and place an array of fibers 111 into an array of substrate grooves 112 within a substrate strip 113. Referring back to FIG. 4, this shows a means by which the arrays of fibers 95 or 100 may be efficiently batch processed to place them into their respective arrays of substrate grooves found within their respective substrate strips 94 and 99. In FIG. 5, two of the fibers of the fiber array 111 are labeled as pair 114. A corresponding pair of substrate grooves 115 of the array of grooves 112 is also shown.

[0058] Although not shown in FIG. 5, it can easily be envisioned that two or more of the fibers (e.g. 114) may be actually uncut segments of a single, unbroken fiber which is continuous and looped around the substrate 113 to occupy multiple block grooves (e.g. 118) and multiple grooves (e.g. 115) of the substrate 113.

[0061] FIG. 8 shows the manufacture 170 of a multi-channel optical add-drop multiplexer 171 (OADM). Many other apparatuses, such as a one-to-many power splitter, can be created using a similar structure. This add-drop multiplexer 171 is made from a first strip of half-couplers 172 and a second strip of half-couplers 173. The fiber 174 used in this second strip is a single, unbroken fiber and runs in loops to pass once through each of the individual grooves of the substrate strip 175. Preferably, the loops formed by the fiber 174, together with the plane of the substrate 175, all lie close to a common plane for compactness. One skilled in the art will appreciate that many optical losses from inter-connections, including splices, can be avoided by this looping of a single, unbroken fiber in simultaneously forming multiple photonic apparatuses such as 4-port add-drop multiplexers. The detailed steps of fabrication can be taken from those described and illustrated with reference to FIG. 2 above. What is formed can be a many-to-one combiner

or multiplexer or a one-to-many splitter or demultiplexer. If a demultiplexer is intended, one skilled in the art will know to include a grating within the fiber at the region of the side-polish and/or between the two side-polished areas of the two fibers comprising the 4-port apparatus. With the addition of a film or slice of an electro-optically or thermally active material (for example a suitable polymer or crystal), sandwiched within the interface between the two side-polished areas of the fibers, switching arrays can be formed in a similar manner to the above. By stacking multiple units of the OADM strip structure described, compact assemblies can be achieved from which to implement optical functions having many channels or cross-points.

Appendix 2 to Amendment B

With Changes to FIGS. 1A, 1B, and 3 Marked Up in Red

And Also Showing a Clean Amended Copy for Clarity and Completeness

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Pursuant to Rule 121, attached are marked-up copies in red of changes to FIGS. 1A and 1B and FIG. 3. FIGS. 1A and 1B are on a first sheet with a top centered page callout of "1/10", while FIG. 3 is on a second sheet with the callout "5/10", both as they were with the original application.

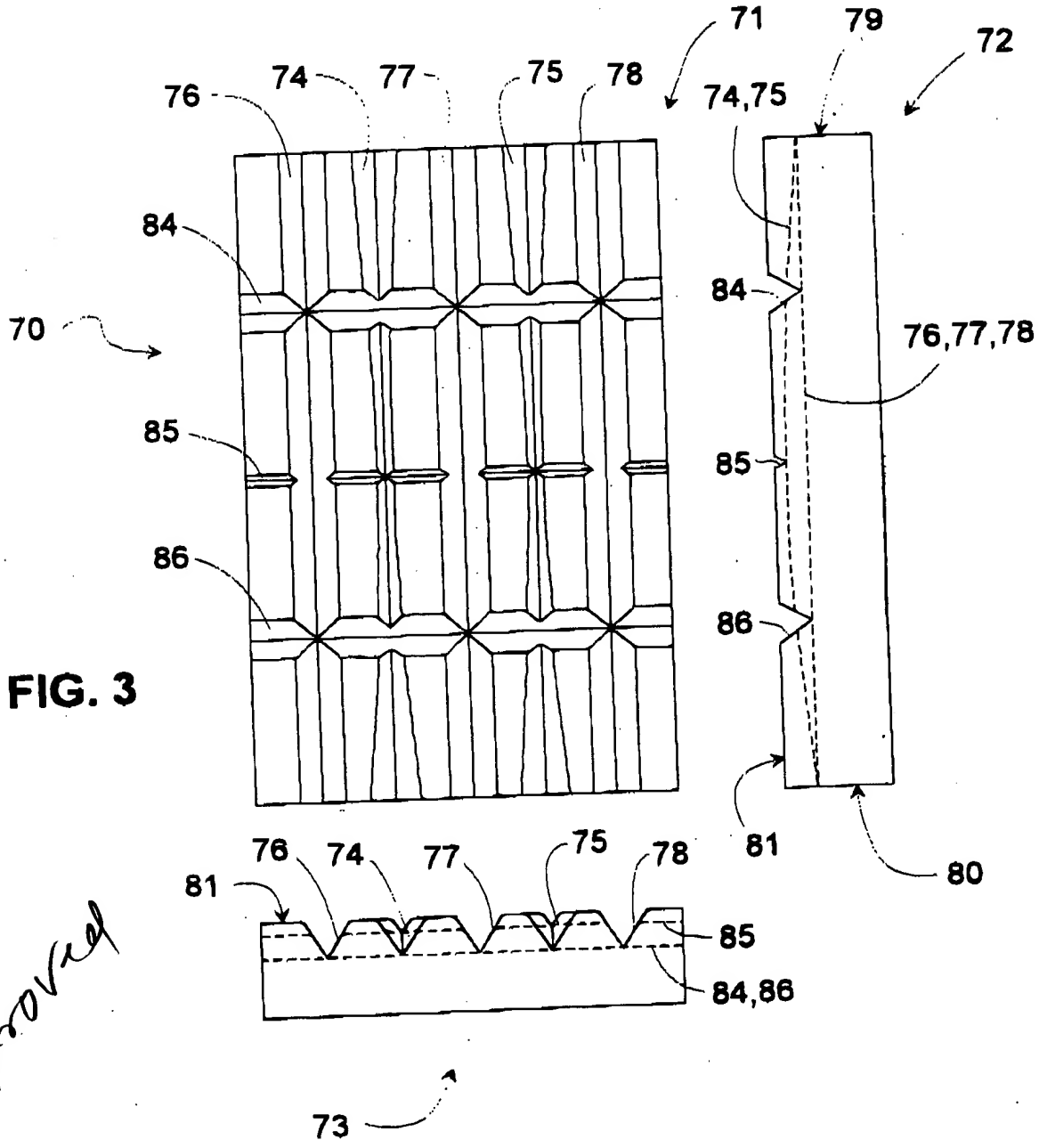


FIG. 3

not approved

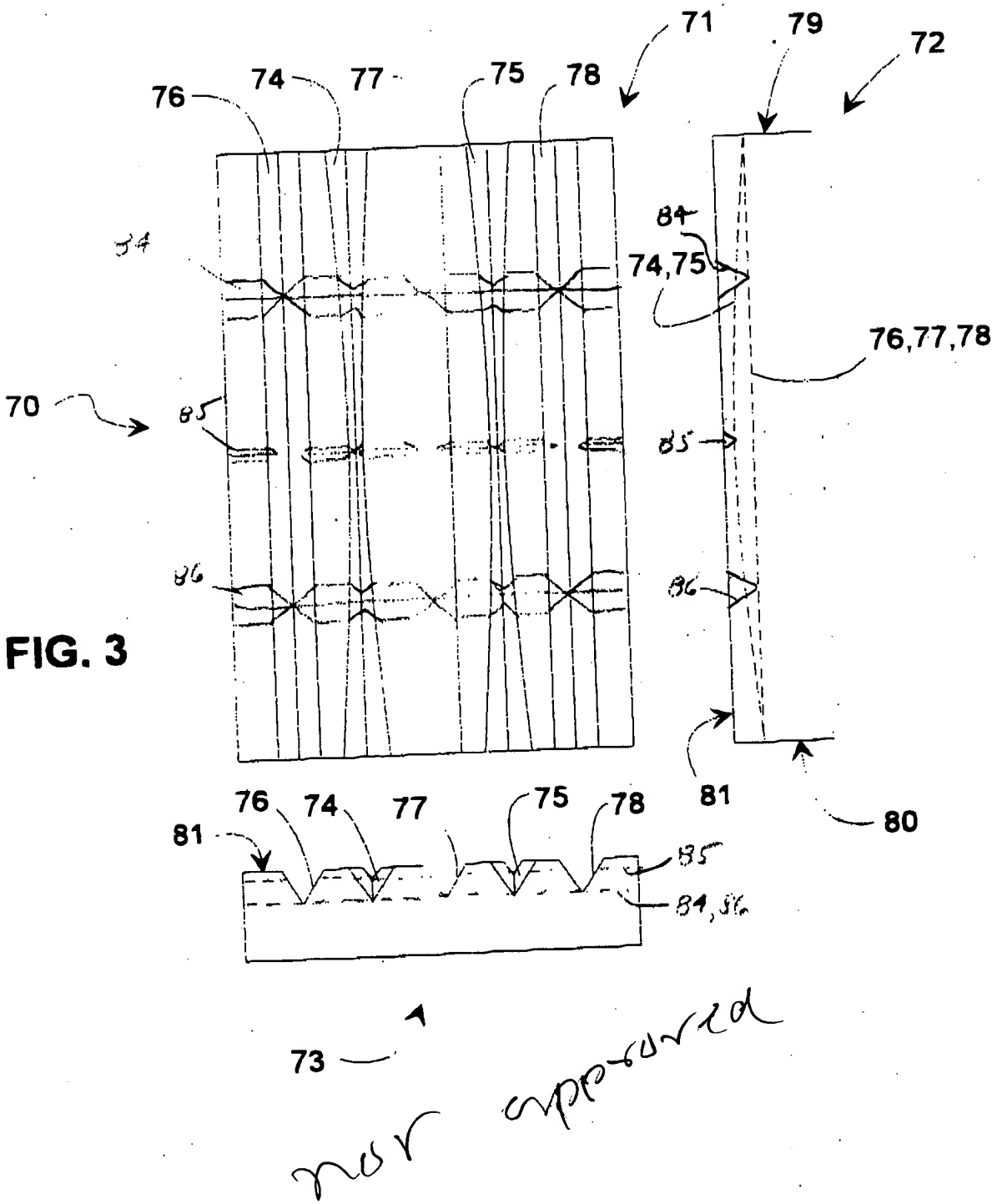
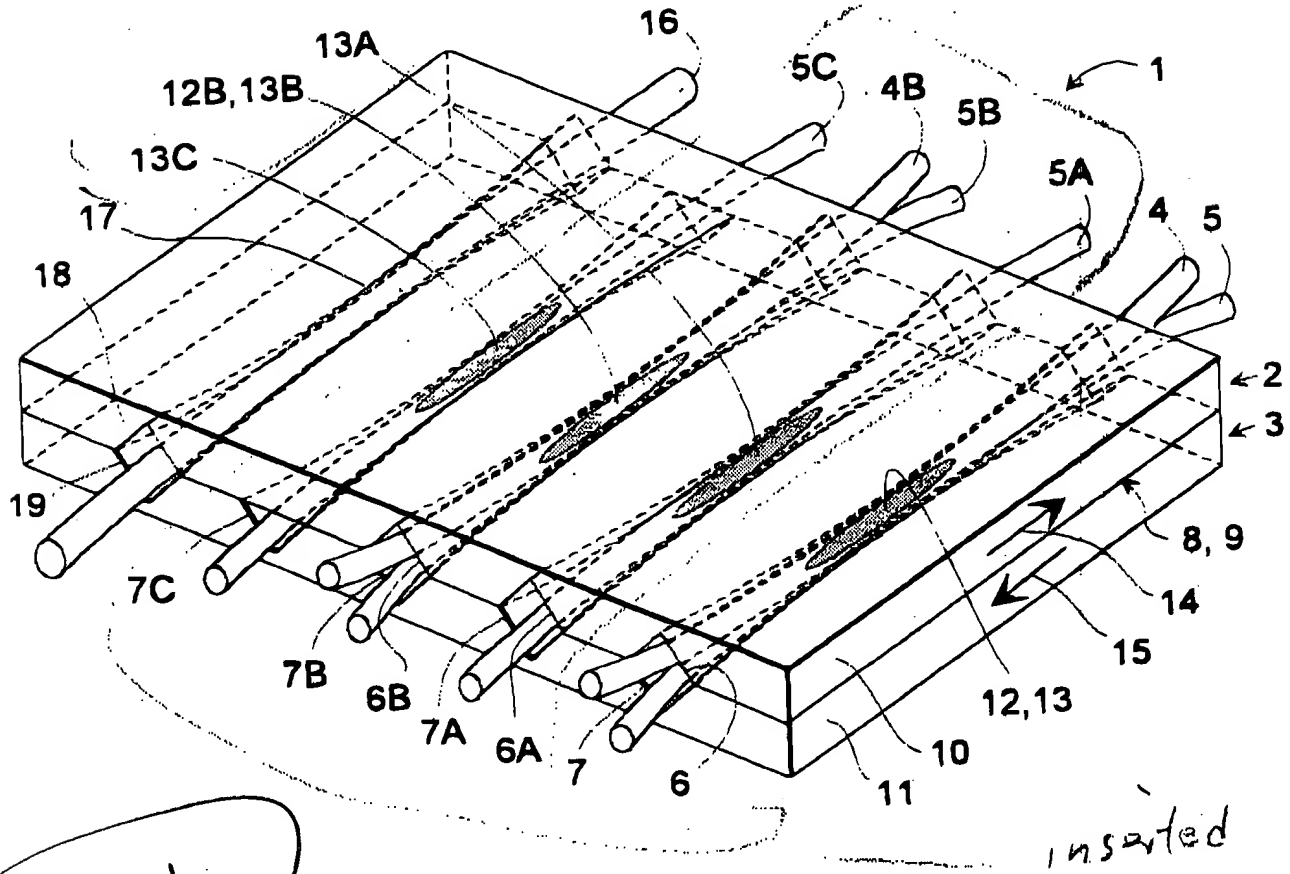


FIG. 3

not exposed

Integrated Manufacture of Side-Polished Fiber Optics
09/837,325 04/18/2001 Barclay J. Tullis

FIG. 1A



inserted

may approved

FIG. 1B

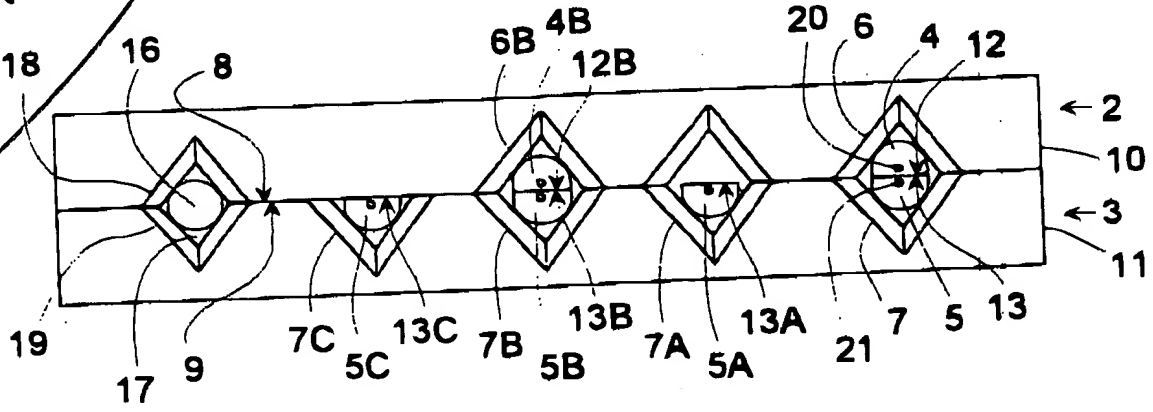
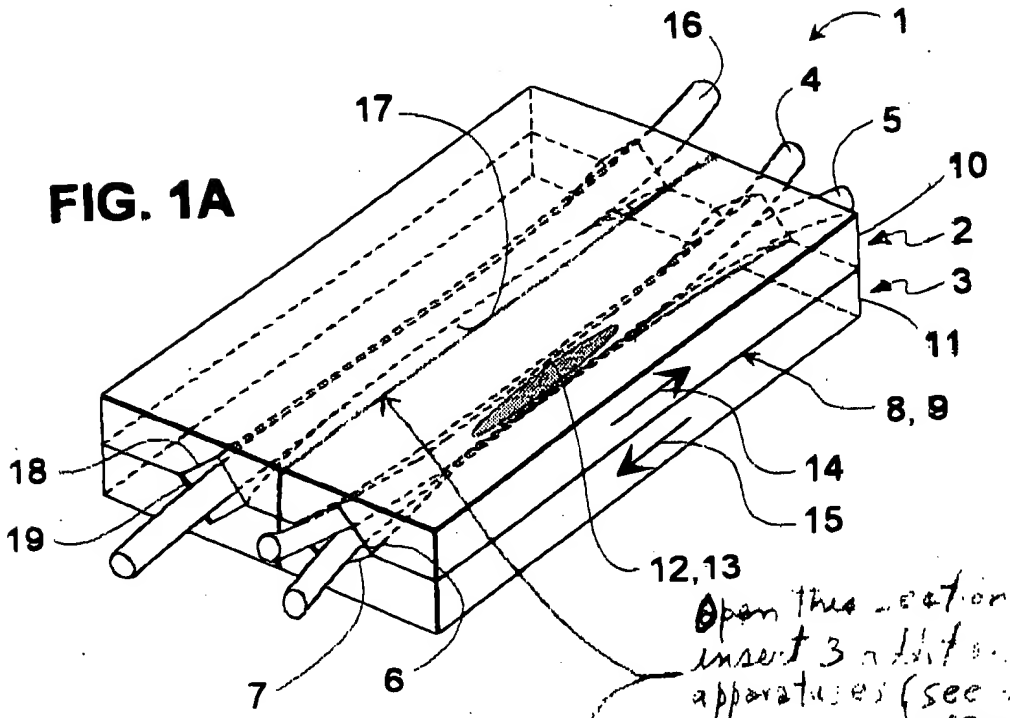


FIG. 1A



Open this section and insert 3 additional apparatuses (see attached copy)

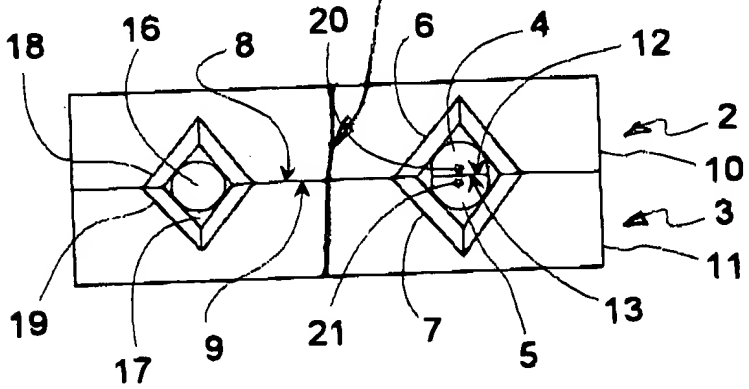


FIG. 1B